

Potential of Purple Sweet Potato (*Ipomoea batatas* var. Ayamurasaki) Skin Extract Cream Preparation as an Antibacterial Against the Growth Activity of *Propionibacterium acnes*

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ABSTRACT

This study aims to determine the potential of a purple sweet potato (*Ipomoea batatas* var. Ayamurasaki) skin extract cream preparation on the growth activity of *Propionibacterium acnes* and determine the most effective concentration of the cream preparation. This type of research is experimental, namely laboratory research. Extraction process sample deusing the maceration method, the extract is made in the form of a cream dosage, next the growth activity of *Propionibacterium acnes* was tested. The research results show that cream preparations purple sweet potato (*Ipomoea batatas* var. Ayamurasaki) skin extract potentially hindering growth of *Propionibacterium acnes*, and the concentration of the cream preparation that is most effective in inhibiting growth *Propionibacterium acnes* is a concentration of 3% (FIV) with a Sig value. $0.000 < 0.05$ (*Oneway Anova* $\alpha=0.05$) in bacterial inhibition in the strong category (10–20 mm)

INTRODUCTION

Plants are biodiversity that is always around us, whether they grow wild or are deliberately cultivated. Since ancient times, herbs or plants have been used as medicinal plants, although their use has been spread from generation to generation or by word of mouth. Basically, this is supported by scientific research that functionally plants are no longer seen as just consumption or decoration materials but also as multifunctional medicinal plants. Medicinal plants have long been used by Indonesian people as an alternative treatment, both for preventing disease (preventive), healing (curative), restoring health (rehabilitative), and improving health (promotive). This is because plants contain many compounds that have properties, especially for improving health (Anggorowati et al., 2016; Widyaningrum et al., 2019).

Biodiversity and medicinal plants with various scientific research in the development of active compounds contained in them make it possible to provide antimicrobial sources originating from plants or plant parts which in the end can be used as raw materials for medicines (Indrawati, Isnaeni, Baharuddin, et al., 2022). Apart from that, this is also confirmed by other research conducted by Indrawati and Baharuddin in 2022, in their quote, revealed that medicinal plants have long been used as conventional medicine. Medicinal plants in question are plants or parts of plants that can be used as the main raw material for medicine. Plants or plant parts that can be used as raw materials for medicines are obtained through the results of an extraction method (Indrawati, Baharuddin, et al., 2022).

Sweet potatoes are a food ingredient that is often found in Indonesia. The types of sweet potatoes found are purple, yellow, red and white. Purple sweet potato is known by the name *Ipomoea batatas* var. Ayamurasaki is a fairly high source of carbohydrates and calories, besides that it also contains flavonoids, tannins, protein, fat, crude fiber, vitamins and minerals. The purple color of sweet potatoes is due to the anthocyanin content, which is a compound that has antioxidant, antibacterial and anti-inflammatory properties. Anthocyanin levels in this purple sweet potato is 560 mg/100 g tubers, higher than purple sweet potato from Japan (Ginting et al., 2011; Samputra, 2019). Sweet potato skins of this variety (*Ipomoea batatas* var. Ayamurasaki) it has not been widely used by Indonesian people, and is often only considered as rubbish or waste. Even though it contains high levels of anthocyanin bioactive compounds, it can also be used as a natural food coloring and as an acid-base indicator (Mahfudhi, 2017). According to research results by Dewi, et.al. in 2014, purple sweet potato skin was scientifically proven to have higher anthocyanin levels than the tuber flesh. The research results obtained show that the ethanol extract of purple sweet potato peel has metal chelating ability with an IC₅₀ value of 322.08 ppm (Dewi et al., 2014).

Other research conducted by Anggi and Sulfani in 2019, stated that Purple sweet potato peel extract which is made in ointment preparations from various extract concentrations contains flavonoid compounds with a total of 8.36% w/w and has inhibitory activity against *Staphylococcus aureus* and produces good physical ointment quality (Anggi & Sufiani, 2019). Apart from that, the results of research by Paramitha et al., in 2016 were obtained purple sweet potato skin

extract is able to inhibit isolates *P. acnes* starting at a concentration of 1000 mg/mL with a resulting barrier zone diameter value of 10.3 ± 0.03 mm and is included in the resistant category (Paramita et al., 2016).

Propionibacterium acnes is a gram-positive bacteria, is facultative anaerobic, generally found on the skin as the cause of acne (Indrawati, Isnaeni, & Baharuddin, 2022). *Acne* is a skin disease which is generally characterized by the presence of spots on the face, chest and back, as well as the appearance of blackheads, pustules, papules, nodules, cysts and scars. Various factors influence the development of acne, namely increased sebum production, bacterial colonization, especially *Propionibacterium acnes* in the ducts pilosebaceous and inflammation. Another hypothesis that influences acne is the presence of ROS as inflammatory mediators released by phagocytes such as neutrophils. Acne treatment requires compounds that can inhibit the *Propionibacterium acnes* population and inhibit the lipase activity of *Propionibacterium acnes*, thereby potentially reducing pro-inflammatory lipids in sebum and reducing the possibility of scar formation after acne appears. Antioxidant compounds are useful in reducing the formation of hypertrophic scars and keloids on the skin. One compound that is known to have very high activity as an antioxidant, anti-inflammatory and antibacterial is anthocyanin (Batubara et al., 2010; Paramita et al., 2016; Pothitirat et al., 2010). According to (Paramita et al., 2016) in his quote, she states that controlling acne can be carried out by compounds that have antibacterial, antilipase, anti-inflammatory and antioxidant activity.

Purple sweet potato skin it self is one of the others that has been proven to have antioxidant activity, but antibacterial activity against *Propionibacterium acnes* has not been widely reported, so it is necessary to carry out further research and studies so that it can be used as a reference in handling the growth of microorganisms. In this study, researchers tried to study further about *Ipomoea batatas* var. Ayamurasaki through testing the skin extract by making the pharmaceutical preparation in the form of a cream to make it easier to use topically. This is because cream preparations are preferred by the public because they are easy to clean and easy to spread, besides that they can provide an optimum effect because they are able to increase the concentration gradient of active substances that penetrate the skin so that percutaneous absorption increases. Next, the pharmaceutical preparation is tested for its potential for growth activity *Propionibacterium acnes*.

The aim of this research was to determine the potential of purple sweet potato skin extract (*Ipomoea batatas* var. Ayamurasaki) cream preparations on the growth activity of *Propionibacterium acnes*, and determine the most effective concentration of cream preparations in inhibiting the growth of *Propionibacterium acnes*.

LITERATURE REVIEW

Ipomoea batatas L. or what is better known as sweet potato or cassava has another name, selebun, sweet potato is a type of tuber that has many advantages compared to its peers, including having a high carbohydrate and energy content so that it can restore energy by fast, and also contains other substances that are very important for the human body, such as fiber, vitamins, minerals and anthocyanins, especially in red and purple sweet potatoes which function as antioxidants. Anthocyanins in purple sweet potatoes (*Ipomoea batatas* var. Ayamurasaki) also have physiological functions as anticancer, antibacterial, and act as protection against liver damage, heart disease and stroke. Purple sweet potatoes have advantages, one of which is that they contain antioxidants which are very useful for the body and anthocyanin pigments which are higher than other sources such as red corn, blueberries, and purple cabbage (Rosidah, 2014).

The results of research conducted by Salim et al., in 2017 showed that purple sweet potatoes have high antioxidant activity. The IC₅₀ value for reducing DPPH from fresh purple sweet potato extract is 5.00 ppm, steamed purple sweet potato has an IC₅₀ value of 47.82 ppm, while boiled sweet potato has an IC₅₀ value of 86.22 ppm (Salim et al., 2017). Apart from that, according to Husna, et al., in 2013 in research by Saputri, et al., 2021 stated that one of the ingredients in purple sweet potatoes that contains antioxidant activity is anthocyanin, which also gives the sweet potato its purple pigment. The anthocyanin content contained in fresh purple sweet potatoes with a deep purple color is 61.85 mg anthocyanin/100 g of material (Husna et al., 2013; Saputri et al., 2021). Gel purple sweet potato extract with a concentration of 30% is an effective dose that can be used as an alternative therapy for open wounds (Samputra, 2019). Apart from that, according to Dipahayu in 2018, ethanol extract of Purple Sweet Potato leaves of the Antin 3 (EA3) variety could be an antibacterial alternative because it contains flavonoid, tannin and saponin compounds. The research results showed that the average inhibitory power of *S. aureus* by EA3 was 30%, 40%, and 50%, respectively, 10.17 mm; 9.84 mm; and 10.9 mm while the average inhibitory power on *P. aeruginosa* by EA3 was 30%, 40% and 50% respectively 9.7 mm; 11.37mm; and 12.1mm. These data show that EA3 produces a wider *P. aeruginosa* inhibition zone than *S. aureus* but both are in the strong category (50% concentration) (Dipahayu, 2018).

Purple sweet potato skin is a waste product with little economic value. Nevertheless, it his purple sweet potato skin ingredient contains a number of potential bioactive components, one of which is anthocyanin. The presence of anthocyanin compounds in purple sweet potatoes is quite interesting because apart from being a natural coloring, it is also a very useful source of natural antioxidants. Agung in 2012, stated that the results of anthocyanin extraction from purple sweet potato skin waste were 729.74 mg/100 g, while the anthocyanin content in purple sweet potato tubers was lower (Gafar et al., 2022; Rohmatin, 2015). Purple sweet potato skin is starting to get attention for application in the feed and food sector because of the high amount of phenolic and anthocyanin compounds contained in it (Anastácio & Carvalho, 2013). Purple sweet potato skin contains anthocyanin and antioxidant activity that is

higher than the flesh of the tuber (Zhu et al., 2010). Purple sweet potato skin is also reported to have potential wound healing activity tested in animal models which is associated with antioxidant activity (Panda et al., 2011).

The intensity of the purple color found in sweet potatoes is caused by the presence of natural dyes called anthocyanin. This anthocyanin dye is a group of pigments that cause a reddish color, and is found in cell fluids and is easily soluble in water. Part of the anthocyanin component of purple sweet potato is the mono or diacetyl derivative 3-(2-glucosyl) glucosyl-5-glucosyl peonidin and cyanidin. The function of this anthocyanin compound is known as an antioxidant and antidote to free radicals, so it can function to prevent cancer, aging and degenerative diseases. Apart from that, anthocyanins are also able to function as antimutagenic and anticarcinogenic, antihypertensive, prevent liver function disorders, and can lower blood sugar levels (Hidayanti et al., 2021; Husna et al., 2013).

The results of other research conducted by Paramitha, et al., in 2016, showed that the antibacterial activity of purple sweet potato skin extract was better than black grape skin extract in inhibiting the growth of *Propionibacterium acnes* bacteria, but the inhibition was still in the resistant category. The anthocyanin compounds found in purple sweet potato skin are glycoside forms of anthocyanidin compounds and are part of the secondary metabolites of flavonoids. There are many scientific publications regarding the benefits of anthocyanins in the world of health. Its benefits for human health have been felt since the 16th century. Anthocyanins have been proven to have antioxidant, anticancer, anti-inflammatory, antibacterial, and lipid peroxidation activities (Paramita et al., 2016).

Anthocyanins also play an important role in reflecting and repairing DNA, which can optimize the functions of body cells, thereby inhibiting the aging process. In other words, consuming purple sweet potatoes with high levels of anthocyanins regularly has the potential to stay healthy and youthful (Rosidah, 2014).

METHODOLOGY

Types of Research

This type of research is experimental which is laboratory research for test potential of extract cream preparations purple sweet potato skin (*Ipomoea batatas* var. Ayamurasaki) on the growth activity of *Propionibacterium acnes*.

Research Population and Sample

The population in this study was purple sweet potato plants (*Ipomoea batatas* var. Ayamurasaki) originating from the Malino area, Gowa Regency, South Sulawesi Province. The sample used was the skin of purple sweet potato that had been processed separated from the tuber flesh.

Collection and Processing of Test Materials

Purple sweet potato samples were taken and collected, then cleaned of impurities by washing in running water. After that, peel and take the skin and then cut into small pieces, after collecting the skin, continue washing again with running water and then drain. Next, it is dried by air-drying while occasionally

drying using the oven. Once dry, then grind using a blender until it forms a coarse powder (simplicia). The obtained simplicia is placed in an airtight container, then it is ready to be made into an extract.

Preparation of Purple Sweet Potato Skin Extract (*Ipomoea batatas* var. *Ayamurasaki*)

The extraction process is carried out by maceration, by weighing 500 g of simplicia powder, then putting it in a container (glass jar) while pressing it with a stirring rod until the surface is even, then adding 96% ethanol solvent until the sample is completely submerged (75 parts of filter liquid with 10 simplicia part), then covered and left for 3 x 24 hours at room temperature protected from light, while stirring repeatedly. After three days, it is filtered into a holding container, then the dregs are squeezed out, then enough filtering liquid is added and stirred, then filtered again until the juice is collected into the previous holding container. The juice obtained was closed and stored in a place protected from light for 2 x 24 hours, the precipitate formed was separated and the filtrate was concentrated using a rotary vacuum evaporator at a temperature of 50°C with a rotation speed of 50 rpm to remove the solvent. Next, the extract obtained is evaporated over a waterbath at a temperature of +40°C so that any remaining solvent can be removed, thus obtaining a thick extract. After that, the extract is weighed to determine the yield, then stored in a closed container before being used for further testing.

Extract Characterization Testing (Extract Parameters)

Extract characterization testing includes yield, shape, color, odor, and taste.

Making Skin Extract Cream Preparations Purple Sweet Potato Cream Formula Composition

Table 1. Cream Formula (Oil in Water) with a Modified Cream Base Referring to Research (Sari et al., 2021).

Material	FI Negative Control (%)	FII (%)	FIII (%)	FIV (%)	FV (Positive Control)
Bark extract purple sweet potato	-	1	2	3	ACN
Stearic acid	12	12	12	12	
Propylene glycol	10	10	10	10	
Cetyl alcohol	3	3	3	3	
Triethanolamine	3	3	3	3	
Glycerin	4	4	4	4	
Methyl paraben	0.2	0.2	0.2	0.2	
Propyl paraben	0.02	0.02	0.02	0.02	
Aquadest ad	100 ml	100 ml	100 ml	100 ml	

Cream Formula Making

Making a cream formula using purple sweet potato skin extract with a cream base consisting of stearic acid, propylene glycol, cetyl alcohol, triethanolamine, glycerin, methyl paraben, propyl paraben and distilled water were made into four formulas with varying concentrations different. Formula I (Negative Control=without purple sweet potato skin extract), while Formula II, Formula III, and Formula IV use purple sweet potato skin extract with concentrations of 1%, 2%, and 3% respectively. Making the cream base is done by melting the oil phase, namely stearic acid, cetyl alcohol, and propyl paraben in a water bath with a temperature of around 70°C. Then the water phase is methyl paraben, triethanolamine, propylene glycol, glycerin, and distilled water are heated over a water bath to a temperature of around 70°C is maintained. Put the oil phase into a hot mortar, then add the water phase and grind until a cream base is formed, then add each extract concentration little by little while stirring until homogeneous. Formula V (Positive Control) use a cream preparation *Activ Clear Nutrica* (ACN).

Evaluation of Physical Properties of Cream

Evaluation of the physical properties of the cream refers to research (Buang & Suherman, 2019; Sari et al., 2021; Suherman & Isnaeni, 2019):

Organoleptic Tests

Organoleptic testing includes direct examination of changes in shape, color, and odor of the cream preparation that has been made.

pH Test

The pH check is carried out by dipping the pH meter (electrode) into the cream preparation until it shows a constant pH. The pH of facial skin is in the normal range 4.5–5.5 for women and 4–5.5 for men.

Homogeneity Test

Homogeneity testing is carried out by weighing 0.1-0.5 g of cream, then smearing it on a glass object, then covering it with another glass object, then visually observing whether there are unmixed particles or lumps in the cream.

Spreadability Test

Spreadability testing was carried out by taking 0.5 g of cream and placing it on a transparent glass plate with graph paper as a base, then covering it with another transparent glass plate as an initial load, then leaving it for 1 minute, then adding a load of 50 g, 100 g, and 150 g and measured the diameter of the cream formed.

Adhesion Test

Adhesion strength testing was carried out by weighing 0.25-0.5 g of cream placed on a glass object, then covering it using another glass object and placing a weight weighing 500 g for 5 minutes. Next, clamp the object glass to the tool and then release a weight weighing 80 g so that it will pull the bottom of the object glass. Then note the time it takes for the two object glasses to separate.

Testing of Purple Sweet Potato Skin Extract Cream (*Ipomoea batatas* var. *Ayamurasaki*) on the Growth Activity of *Propionibacterium acnes*

Testing cream preparations refers to modifications of research work (Baharuddin & Isnaeni, 2020; Buang & Suherman, 2019), namely 15 ml of Mueller Hinton Agar (MHA) media was poured aseptically into each sterile petri dish, then 1 ml of the test bacterial suspension was added *Propionibacterium acnes*, then homogenized and allowed to solidify. After solidifying, on the surface of the media, a paper disc is placed which has previously been soaked in a purple sweet potato skin extract cream preparation according to the formula concentration (FII, FIII, FIV), negative control (FI) and positive control (FV=using ACN cream preparation). The distance of the paper disc is set from the edge of the petri dish at least 20 mm, after that it is incubated for 1 x 24 hours at 37°C. The area of resistance formed is measured using a slide rule. This treatment was replicated 3 times, then the average and standard deviation were calculated.

Observation, Inhibition Zone Diameter Measurement and Data Analysis

Observations and measurements of the diameter of the inhibition zone were carried out after incubation for 1 x 24 hours at 37°C using a slide rule. Data from measurements of the diameter of the *Propionibacterium acnes* growth inhibition zone were then analyzed using the analysis of variance method (*oneway* ANOVA) and correlation tests using the IBM SPSS Statistics version 26 program.

RESULTS

Characterization Testing Extract (Extract Parameters)

Table 2. Characterization Test Results for Purple Sweet Potato Skin Extract (*Ipomoea batatas* var. Ayamurasaki)

Specification	Extract Description
Yield (%)	8,024
Form	Concentrated Extract (thick)
Color	Blackish brown
Smell	Distinctive, and not overpowering
Flavor	Bitter, Astringent

Check Up Result Physical Properties of Cream Purple Sweet Potato Skin Extract

Table 3. Organoleptic Test Results

Observation	Cream Formula Purple Sweet Potato Skin Extract			
	FI (Negative Control)	FII (1%)	FIII (2%)	FIV (3%)
Color	White	Light brown	Chocolate	Chocolate
Smell	No smell	Typical	Typical	Typical
Form	Cream	Cream	Cream	Cream

Table 4. Results of pH Test, Homogeneity Test, Spreadability Test and Adhesion Test

Observation	Cream Formula Purple Sweet Potato Skin Extract			
	FI (Negative Control)	FII (1%)	FIII (2%)	FIV (3%)
pH	5,11	5.08	4.97	4.74
Homogeneity	No coarse grains (Homogeneous)	No coarse grains (Homogeneous)	No coarse grains (Homogeneous)	No coarse grains (Homogeneous)
Spreadability (cm ²)	6.08	5.93	5.82	5.68
Stickiness	4.37	4.61	4.83	4.89

Cream Preparation Test Results Purple Sweet Potato Skin Extract (*Ipomoea batatas* var. Ayamurasaki)

Table 5. Results of Measuring the Diameter of the Resistance Zone for Preparation Purple Sweet Potato Skin Extract (*Ipomoea batatas* var. Ayamurasaki) on the Growth Activity of *Propionibacterium acnes* After an Incubation Period of 1 x 24 hours at 37°C.

Test Bacteria	Obstacle zone diameter (mm)				
	Skin extract cream preparationpurple sweet potato (<i>Ipomoea batatas</i> var. Ayamurasaki)				
	FI (Negative Control)	FII (1%)	FIII (2%)	FIV (3%)	FV (Positive Control)
<i>Propionibacterium acnes</i>	6.5	9.5	12.5	13.5	22.6
	6.8	8.5	12.5	14.5	23.6
	6.8	10.5	13.5	14.5	23.6
Amount	20.1	28.5	38.5	42.5	69.8
Average	6.70	9.50	12.83	14.16	23.26
SD	±0.173	±1,000	±0.577	±0.577	±0.577

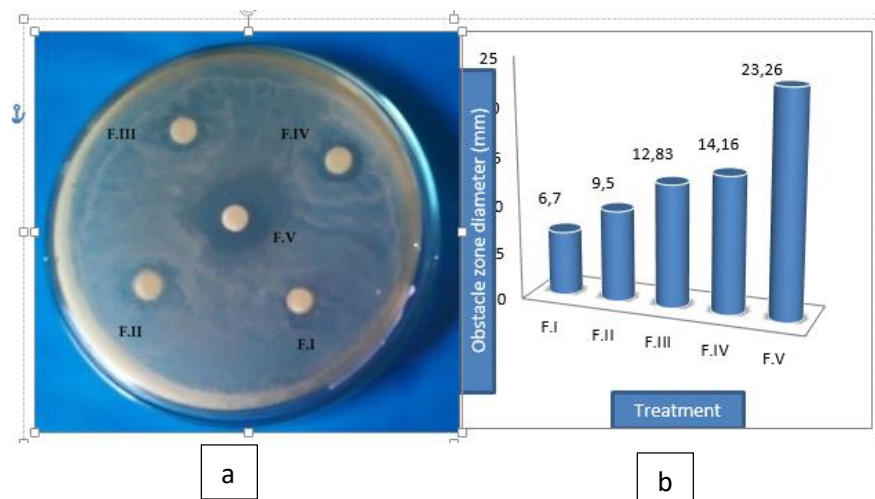


Figure 1. a) Formation of Barrier Zones; b) Graph of Obstacle Zone Diameter Measurement Results

Figure 1. a) Observation Results of the Barrier Zone Area from Purple Sweet Potato Skin Extract Cream Preparation on Growth *Propionibacterium acnes* after incubation 1x24 hours at 37°C;

b) Histogram of Obstacle Zone Diameter Measurement Results (mm)

Information:

FI Control (-) = Cream base (without purple sweet potato peel extract)

FII 1% = Cream preparation of purple sweet potato skin extract 1%

FIII 2% = Cream preparation of purple sweet potato skin extract 2%

FIV 3% = Cream preparation of purple sweet potato skin extract 3%

FV Control (+)=Cream preparation *Activ Clear Nutrica*

DISCUSSIONS

Scientific research over the last few decades in the health sector has increased along with the development of technology, especially in the development of plants or plants as alternative medicine, many studies both in vivo and in vitro have shown the antimicrobial activity of medicinal plants. Apart from being easy to obtain, medicinal plants also have high efficacy and tend to have a lower risk of side effects. The potential of a medicinal plant can be seen if it has effectiveness or activity in inhibiting the growth of disease-causing microorganisms, this is caused by the presence of a chemical compound or component that has antimicrobial or antibacterial properties. In developing countries around 70% to 80% of the population relies on traditional therapy and the use of plant extracts as the main source of medicine to treat a disease.

One of the many medicinal plants currently receiving attention is the purple sweet potato which is specifically known as *Ipomoea batatas* var. Ayamurasaki. Ingredients other than a fairly high source of carbohydrates and calories and also contains flavonoids, tannins, protein, fat, crude fiber, various vitamins and minerals, apart from that there is also anthocyanin content which is a natural coloring substance that functions as an antioxidant and free radical catcher, so this natural substance has potential and important role in human life because

apart from its properties as an antioxidant, it is also able to prevent cancer, premature aging, and other generative diseases. Apart from that, it also has the ability to antimutagenic, anticarcinogenic for liver function disorders, antihypertensive, and lowers blood sugar levels. Several studies have proven that apart from the anthocyanin compounds in purple sweet potatoes, they also play a role in lipid peroxidation, anti-inflammatory, and antibacterial properties.

In this research, the material developed for testing was leather purple sweet potato is made in a pharmaceutical dosage form, making it easier to use topically, namely in a cream dosage form which is then tested for its potential as an antibacterial or antimicrobial on growth activity *Propionibacterium acnes*. Even though so far purple sweet potato skins are considered rubbish which can cause waste and their use by the Indonesian people is not much, on the other hand what needs to be paid attention to is that purple sweet potato skins have bioactive compounds that can be used as raw materials for medicine because they contain anthocyanin compounds which is very high, as well as the phenol content in it which is able to function as an antioxidant and antibacterial in particular. Due to the presence of several active compounds in it and the lack of maximum utilization, purple sweet potato skin is suitable to be used as an active ingredient in antimicrobial cosmetic preparations.

The use of purple sweet potato skin in cream formulations is because it is easy to apply to the skin to be treated, can also be easily spread, is easily washed with water, and there is no blockage of the skin and cream. The oil-in-water (O/W) type cream formula is a preparation with an optimal delivery system for active ingredients, especially polyphenols, and is more easily accepted because it is easy to apply to the skin and leaves a comfortable feeling compared to the water-in-oil (W/O) type cream (Bernatoniene et al., 2011; Dipahayu et al., 2014). The advantage of oil-in-water (O/W) type cream is that it has a high water content so it can provide a hydration effect which increases the penetration of active substances (Nofriyanti & Wildani, 2019; Sari et al., 2021). Another advantage is that O/W type cream can provide an optimum effect because it is able to increase the concentration gradient of the active substance that penetrates the skin so that percutaneous absorption increases (Engelina et al., 2013; Sindang & Astuti, 2018).

This research also involves various processes and methods to obtain maximum results from a preparation starting from processing test materials, extraction processes, determining characteristics, making formulations, evaluating and testing as antibacterial or antimicrobial, where the testing is on activity growth of *Propionibacterium acnes* as a test indicator. The purple sweet potato skin extraction process is carried out by maceration because this method is simplicity extraction process through soaking the material with a suitable solvent to obtain active compounds without any heating process. Anthocyanins and phenols in purple sweet potato skin can be damaged by temperatures that are too high, so maceration extraction is carried out at room temperature using 70% or 96% ethanol solvent. Various types of solvents commonly used for maceration extraction of dyes are ethanol, methanol and distilled water. According to (Husna et al., 2013; Mahfudhi, 2017), stated that ethanol is a good

solvent for the extraction of flavonoids, especially anthocyanins, because it is polar, so it is able to dissolve polar compounds.

Basically, characterization testing on a sample is useful for finding out the quality or grade of a material that has gone through processing to become a simplicia or extract, whether in terms of organoleptic examination, macroscopic testing or microscopic testing, so that these results can be used as a reference in developing further research (Komala et al., 2020). The results of research on purple sweet potato skin extract (*Ipomoea batatas* var. Ayamurasaki) using the maceration extraction method in terms of characterization testing, obtained a yield of 8.024%, in the form of a blackish brown concentrated extract. The yield value shows how much content can be extracted by the solvent in percent (%). However, the yield obtained in this study was lower than the existing reference. According to (Sindang & Astuti, 2018), several factors that influence the small value of a yield are the extraction process itself, and other factors such as place of plant growth, age of the plant, part of the plant used, extraction process and conditions, variety, condition and size of simplicia powder, solvent selection, and solvent evaporation process. The research results can be seen in Table 2.

The results of the extraction and characterization processes that have been obtained are then tested on the purple sweet potato skin extract which has been formulated into a cream preparation which includes organoleptic tests, pH test, homogeneity test, spreadability test, and stickiness test of the purple sweet potato skin cream preparation. In this study, four formulas were made for purple sweet potato skin extract cream, namely formula I without the ingredient is purple sweet potato skin extract and only contains a cream base, formula II has a cream base with the addition of 1% purple sweet potato skin extract as the active ingredient, formula III has a cream base with the addition of 2% purple sweet potato skin extract as the active ingredient, and the formula IV with a cream base with the addition of 3% purple sweet potato peel extract as an active ingredient. Results organoleptic test examination of the 4 cream preparations showed that formula I as a negative control had a white color and was odorless and had a semi-solid form like cream, while the other three formulas with the addition of the active ingredient in the form of purple sweet potato skin extract had a light brown even color. brown in color with a distinctive creamy odor. According to (Juwita et al., 2013), organoleptic testing is carried out to see the physical appearance of the formula preparation which includes checking the shape, color and odor which are observed visually so that the cream can be determined according to the color and odor of the extract used. The research results can be seen in Table 3.

Testing the next purple sweet potato skin cream preparation, namely pH test, homogeneity test, spreadability test, and adhesion test, where the pH test for F1 was 5.11, FII was 5.08, FIII was 4.97 and FIV was 4.74 (Table 4). According to references from (Juwita et al., 2013; Purwanto & Swastika, 2013), the pH test is carried out to ensure the safety of the cream when used so that it does not cause irritation to the skin. Topical preparations must meet these requirements, because if the pH is too alkaline it will result in the skin becoming scaly, conversely if the skin pH is too acidic it can trigger skin irritation. For the homogeneity test, it was

found that the four cream preparations did not contain coarse grains or lumps or unmixed particles, so it could be said that the purple sweet potato skin extract with the cream base used had a homogeneous composition and was easily mixed and did not experience coagulation or phase separation.

For testing the spreadability obtained in this study, the FI (negative control) was 6.08 cm², FII was 5.93 cm², FIII was 5.82 cm² and FIV was 5.68 cm² (Table 4). These results show that the purple sweet potato skin extract cream preparation falls within the range, where the spreadability of a good cream preparation ranges from 5–7 cm. Spreadability testing is carried out to see the spreadability of the cream so that it is easy to apply. The better the spreadability, the wider the contact between the cream and the skin, so that the absorption of the active substance will be faster. According to (Sari et al., 2021), stated that good and appropriate spreadability is caused by the presence of stearic acid and cetyl alcohol which can increase the consistency of the cream which makes it thicker while using triethanolamine can make the consistency thinner so that using a combination of these ingredients can produce a cream base that has good spreadability. Apart from that, the presence of propylene glycol as a solvent and carrier makes the cream base stable and spreads better and wider because it is capable.

Regarding the adhesiveness of the cream preparation, it is closely related to the length of contact between the cream preparation and the skin and the comfort of its use. Test adhesion this is done to determine the ability of the cream to stick to the skin when applied. The greater the adhesion value, the better because it allows the active substance to be completely absorbed. The requirement for good adhesion to the cream is more than 4 seconds (Lumentut et al., 2020; Purwanto & Swastika, 2013). The adhesive power is directly proportional to the viscosity value of the cream preparation produced, the higher the viscosity value, the higher the adhesive power produced (Sari et al., 2021). The results of measuring the adhesion of the purple sweet potato skin extract cream preparation have met the requirements for good adhesion of the cream, where for FI (negative control) it is 4.37 seconds, FII is 4.61 seconds, FIII is 4.83 seconds and FIV is 4.89 seconds. Research results in Table 4.

Testing the potential of the purple sweet potato skin extract cream preparation on the growth activity of *Propionibacterium acnes* with an incubation period of 1 x 24 hours at a temperature of 37⁰ C, the results obtained were an obstacle zone with an average diameter for a 1% w/v concentration preparation (FII preparation) of 9.50 ± 1,000 mm, concentration of 2% w/v (Preparation FIII) was 12.83 ± 0.577 mm, concentration of 3% w/v (FIV preparation) was 14.16 ± 0.577 mm while for the negative control (FI preparation) it was 6.70 ± 0.173 mm and positive control (FV preparation) was 23.26 ± 0.577 mm. In the process of testing this potential, it was seen that there was an increase in the inhibitory power that occurred at each formula concentration, in other words that Purple sweet potato skin extract made in cream dosage form is effective in inhibiting the growth activity of *Propionibacterium acnes*. This can be seen from the data analysis using the analysis of variance test (*oneway* Anova), which obtained SPSS output results with a Sig value is 0.000 < 0.05 so that the average variation in

concentration of purple sweet potato peel extract in the preparation formula and the resulting inhibition zone is significantly different, which means there are differences between treatments, where the higher the concentration extract the purple sweet potato skin in the formula tested, the greater the diameter of the inhibition zone produced in growth activity *Propionibacterium acnes*. The test results can be seen in Table 5.

Analysis testing was continued with the LSD test to determine differences in effects between treatments. The test results showed that there were differences between all treatments, in this case purple sweet potato skin extract in a cream preparation with a concentration of 3% provided the largest zone of inhibition and was significantly different from other concentrations. Based on the results of further tests with the smallest real difference test, it shows that there is a very significant difference in effect or there is a significant difference in effect between each treatment group and the control group, both negative control and positive control.

Test result the potential of the cream preparation turns out to be that various concentrations of the active substance (purple sweet potato peel extract) used in the formula starting from concentrations of 1% (FII), 2% (FIII) and 3% (FIV) have different barriers to growth activity *Propionibacterium acnes*, but in terms of classifying purple sweet potato skin extract as antibacterial or antimicrobial (extract or in cream dosage form) it is in the moderate-strong inhibitory category. This can be seen in the quotation from the research results (Suherman et al., 2018), states that in the category of inhibition which is based on the diameter of the inhibition zone, namely for the inhibitory response in the weak category it has an inhibition zone diameter (mm) of ≤ 5 mm, for the medium category it is 5–10 mm, for the strong category it is 10–20 mm, while the inhibitory response in the very strong category is ≥ 20 mm.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of research and data analysis, it can be concluded that the cream preparation purple sweet potato skin extract (*Ipomoea batatas* var. Ayamurasaki) has potential as an antibacterial in inhibiting growth of *Propionibacterium acnes*, and the most effective concentration of the cream preparation is a concentration of 3% (FIV) with a Sig value $0.000 < 0.05$ (Oneway Anova $\alpha = 0.05$), with inhibition is in the strong category (10–20 mm).

FURTHER STUDY

The results of research that has been carried out regarding the potential of purple sweet potato skin extract cream preparation (*Ipomoea batatas* var. Ayamurasaki) as an antibacterial against the growth of *Propionibacterium acnes* well as various results in the literature regarding the compound content of purple sweet potato skin, it is recommended that further research and testing of purple sweet potato skin cream preparations be carried out in vivo on test animals.

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